INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

HANDOFF MANAGEMENT IN INTEGRATED WLAN AND WIMAX IN HETEROGENEOUS NETWORKS

MS SONAL D AGRAWAL[1], PROF C.M MANKAR[2]

1. PG Student, SSGMCE College of Engineering Shegaon.
2. Guide, SSGMCE College of Engineering Shegaon.

Accepted Date: 15/03/2016; Published Date: 01/05/2016

Abstract: The vertical handover decision strategy in the heterogeneous wireless networks is very challenging issue because it needs to deal with many different radio access networks and make decisions for vertical handover calls between them. Due to traffic offloading the decisions for vertical handovers to WLAN hotspots in heterogeneous wireless networks are very important because they impact the QoS of the mobile users, especially when they are using real-time services. In this paper we propose vertical handover decision algorithm from WiMAX to WLAN networks based on the user's speed and session's priority (non-real-time or real-time service) of the mobile nodes. The parameters such as vertical handoff delay, in this paper our main contributions are: We will first create network in omnet .In this network there will be base station like 1) WLAN 2) WiMAX. Then every device transfer data and handover will be there in graphs you can see how data from one network to other is transfer and at which point authentication is done.

Keywords: Mobile Device Management, Heterogeneous Mobile Networks, WIMAX, WLAN.

Corresponding Author: MS SONAL D AGRAWAL

Access Online On:

www.ijpret.com

How to Cite This Article:

Sonal D. Agrawal, IJPRET, 2016; Volume 4 (9): 58-71

PAPER-QR CODE

INTRODUCTION

Today, handsets or mobile devices comes with multiple network interfaces which allows the user to choose any one of the available networks like WLAN, WiMAX, Satellite Systems and Bluetooth in addition to the universally available cellular telephony networks. While moving, the mobile devices have to seamlessly transfer the ongoing communication via another link which is best among the available candidates without considerable interruption is called as handoff process. This handoff process can be classified into vertical and horizontal 2; if the old and newly connected Access Point (AP) belongs to the same network technology then it is called as horizontal handoff where as if the old and newly connected Access Point belongs to different network technologies then it is said to be vertical handoff. For the past few years the deployment of WLAN increased throughout the world due to easy installation, low cost and higher bandwidth. Mobility management contains two components such as location management and handover management. Location management enables the system to track the locations of mobile users between communications channel. Wireless technologies such as WLAN, WiMAX, etc were developed with different standards and these technologies offer variety of services, different data rates and diverse area of coverage. One of the forthcoming challenge in network management is to connect between end to end heterogeneous wireless technologies. To provide such end to end connection between heterogeneous networks we need to perform vertical handoff. If the serving and target base station during handoff are of different wireless technologies then such a handoff is called as vertical handoff. The term interworking is used to express interactions between heterogeneous networks with the aim of providing anIEEE 802.11 standards are much cheaper than IEEE 802.16 standards. The deployment of high speed network (11 Mbps in 802.11b and 54 Mbps in 802.11a/g) can be used by unlicensed spectrum (2.4 GHz in 802.11b/g and 5 GHz in 802.11a)[1]. One of the emerging wireless technologies is WiMAX based on IEEE 802.16 standards, where the IEEE 802.16d is for fixed WiMAX and 802.16e for mobile WiMAX system. WiMAX base station offers greater coverage area around 8 Km with data rate of 70 Mbps. Another technology is LTE which was developed by 3GPP with system handover between LTE and 3G such as UMTS, GSM etc.

II LITERATURE SURVEY

WiMAX

WiMAX is a wireless telecommunication technology based on the IEEE 802.16 standard [IEEE2]. It uses licensed spectrum to provide high speed wireless data transmissions over long distances in many different ways. There are a lot of different standards, from 802.16a to 802.16m.

Nowadays there are two 16-2004 and 802.16e [SFC05]. More familiar terms for these standards are Fixed WiMAX (802.16-2004 [IEEE1]) and Mobile WiMAX (802.16e [IEEE2]). By definition, Fixed WiMAX does not support handovers and is therefore not interesting for this research. That is why for the rest of the paper, when the phrase WiMAX is used, Mobile WiMAX (802.16e) is meant. The current version of this standard provides mobility support at frequency bands between 2 and 6 GHz, with vehicular speeds up to 120 kilometres per hour.

WLAN

WLAN is a very popular wireless communication technology for short/medium distances nowadays, mostly because it convenient, easy to deploy, easy to manage and because of it slow infrastructure costs. It is based on the 802.11standard and also knows a lot of different versions; varying from 802.11a to802.11j (and even to 802.11y in the future).A typical WLAN network consists of Access Points (APs) and several wireless clients, called Stations (STAs). It uses unlicensed spectrum radio waves to communicate. Cell radii are up to 100 meter in open field with a maximum speed of 54 Mbps (802.11g standard). WLAN supports PMP mode and ad-hoc mode. Combinations are also possible; this is a so-called hybrid network. Today, the standard 802.11g, generally referred to as Wi-Fi, has been implemented all over the world. For the remaining part of the paper, when WLAN is used, 802.11g is meant. Just like every other 802.x standard, the MAC and PHY layers are specified. Again, just like WiMAX, physical layer specifies the modulation scheme used and signaling characteristics for the transmission through the radio frequencies, whereas the MAC layer defines a way accessing the physical layer. Handovers are an important part of a network technology. When moving between different BSs, the connection also has to move. Seamlessness in this paper is defined as follows: the current session, QoS and Service Level Agreements (SLA) must be maintained during and after handover. In other words, a seamless handover is a handover that is seamless to the user. Obviously this also depends on the kind of service the user is requiring. With real-time applications like video conferencing or streaming media, the user will probably notice a decrease of the connection. On the other hand, while browsing a website or transferring a file, the user does not have to notice anything of the handover process. The latency and packet loss are the two crucial factors for seamless handover. These two factors have to be as small as possible to make the handover seamless.

There can be several reasons why and when a handover should be initiated.

•MS current position and velocity

High velocity can result in different handover decisions.

•Link quality

Another BS can deliver a higher quality link (e.g. higher speed, stronger signal, better QoS).

•Load at a BS

When a BS in a subnet is currently overloaded; the network can decide to relocate some MS.

•Conserving battery power

In order to save battery power, a MS can choose to

Switch to a closer station to be more energy efficient.

•Context and requirements

When a MS requires different type of service, it can be necessary to switch BS.

There are two types of handovers: horizontal (handovers within the same technology) and vertical (handovers between different network access technologies).

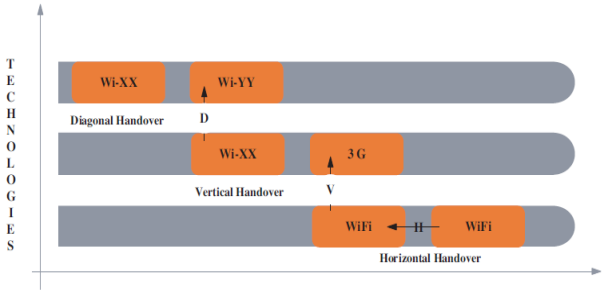

Fig. 1. Handover types

Horizontal Handover: In Horizontal handover process has been considered and studied among wireless networks using the same access technology. When a mobile node moves between two cells using the same technology, then this kind of handover process is defined as horizontal handover. Another way It is also known as Intra cell handover and sustaining the running services is change of IP address like in Mobile IP or dynamically bringing.

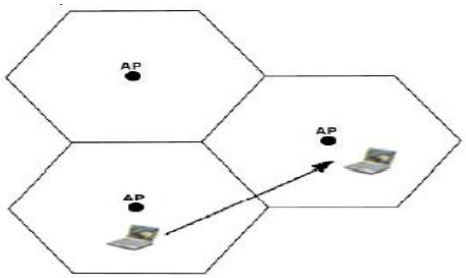

Fig 2 Horizontal Hand Off

In Above Figure 2 shows the horizontal handoff process. In this above figure each hexagon represents the cell of the access point and all of them belong to the same and different wireless network technology. Mobile device moves from one cell to another, the horizontal handoff process is happening.

Vertical Handover: A handover between two different access technologies is says as a vertical handover. It is also known as Inter cell handover as it occurs when the user moves into an adjacent cell and all of the terminals' mobile connections and must be transferred to a new base station [8]. The main concern of vertical handover and uphold running services alteration of IP addresses, but also the modification of network interfaces and QoS features of different networks accordingly.

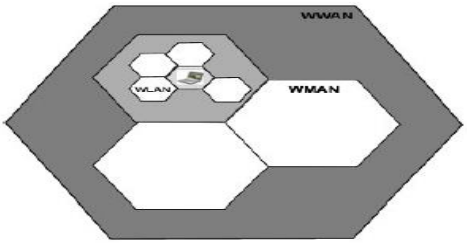

Fig 3 Vertical Handoff

Between two base stations that are used different wireless network technologies [8].Horizontal and vertical network structure that has been increasing cell sizes at higher levels in the hierarchy.

1) **Handover Decision Management:**

Handover is the process of maintaining a user's used a new active session when a mobile device changes its connection point to an access network.Depending on the access network that each point of attachment and belongs to, the handover can be either horizontal or vertical

[4]. A horizontal handover in plant place between points of attachment supporting the same network technology and. on the other hand, a vertical handover occurs between some points of attachment supporting different network technologies.

a) **Cost Function-based Approaches** :

Vertical handover decision cost function: is a measurement of the benefit obtained by handing over to a particular network. An optimized cost function is used to evaluate the target network establishing a tradeoff between user satisfaction and network efficiency. The cost function is applied on two vertical handover policies, one for all the user's active sessions collectively and one for each of the user's active sessions independently

b) **AI-based Approaches**

The concepts of Fuzzy Logic, Neural Networks, Expert Systems, and Genetic Algorithms from AI can be used to choose when handover occurs and which network to choose among different available access networks. These AI mechanisms are combined with multiple criteria or attribute concepts in order to develop advanced decision algorithms for both non-real-time and real-time applications.

III RELATED WORK

OBJECTIVE AND GOAL

Our approach proposes a handover decision process based on a three-phased process to find the network that can best full the user's requirements. The three phases are Network Detection, Network Evaluation, and Handover Execution [1, 2]. Network detection is used to discover available access networks and collect appropriate metrics to evaluate them.

The goal of this Project is to show the development of a simulator for modeling heterogeneous networks transitions for the correct and time based decision making in the vertical handoff process.

CHALLENGES

A lot of research is already done in the field of handovers. With the new and promising wireless broadband solutions, the capability to support fast and reliable handover is critical for its success. Most solutions provide extensions and/or improvements of the current standards in order to improve certain aspects.

EXISTING SYSTEM

There are two types of handoffs that take place in an integrated network. The horizontal handoff between the same networks and vertical handoff between different networks. Handoff decision, radio link transfer and channel assignment are the three stages in a handoff [1]. There are vertical handoffs in two directions, for an integrated cellular or WLAN network, from WLAN to cellular network and the other from cellular network to WLAN. When the cellular network gets into the area of WLAN, used larger bandwidths, it would fancy changing the connection to WLAN. But, on the other hand when user is server by WLAN and moves to cellular network, coverage is abrupt and hence to unwanted voice data call dropping thus affecting the quality of service. Now to make sure the communication is seamless, the user must switched to the cellular network before the WLAN link breaks while reducing the dropping probability of ongoing calls.

PROPOSED CONTRIBUTION

The contribution of this paper is in improving the QoS results when dual mode WiMAX/WLAN terminals are performing vertical handovers from WiMAX to WLAN hotspots. Our main goal was to improve the QoS of the mobile users that utilize complementary WiMAX/WLAN coverage, with the design of the vertical handover decision algorithm that can be easily implemented in the resource management for heterogeneous networks. We practically applied the algorithm in the already existing NIST simulation tool for 802.21 and practically tested it with 30 mobile terminals that use conversational, streaming, web and background traffic. We proved that with the implementation of this vertical handover decision algorithm we can avoid unnecessary vertical handovers to WLAN network and improve the vertical handover latency, packet loss and average throughput of the mobile users which are very important metrics, especially for real time sessions.

PROPOSED REQUIREMENTS

Our proposed requirement is OMNET platform that surveyed the characteristics of mobile devices and OMNET and general functions of emulators and simulators. We also surveyed management issues related to mobile devices in OMNET, especially mobility management for vertical and horizontal Handoff.

Deployment of WLAN increases globally due to its low cost implementation and high speed connectivity. The maximum data rate of 600Mbps provided by 802.11n makes it a popular standard for deploying WLANs. The primary disadvantage in WLAN is its short coverage, which

is not suitable for devices with high velocity. The alternate network technology for WLAN with almost equal bandwidth with wider coverage area is WiMAX, which is the growing technology throughout the world. Hence the integration of WLAN and WiMAX is considered to be a good approach in 4G. This paper presents handoff related issues in WiMAX/WLAN overlay networks, numerical methods for estimating network conditions of both WiMAX and WLAN networks and impact on 802.1ln clients by legacy 802.11a/b/g clients. Also, we propose throughput based proactive handoff algorithm for WiMAX/WLAN overlay networks which considers network condition, bandwidth requirements and client type. Simulation results show that the proposed handoff algorithm improves overall throughput considerably.

DESIGN AND IMPLEMENTATION

PROPOSED SRCHITECTURE

In 4G network, there are different wireless networks available with may the same coverage area. So MS will always ready to connect to heterogeneous networks like WiMAX and WLAN simultaneously. And as we know that every technology needs a gateway to access to Internet. The role of gateway is to provide an IP address to MS with proper authentication to interact to server. At the server the authentication procedure will be performed for the MS. Since each gateway will provide a different IP for each NIC at the MS[6]. So the new MS will have more than one IP address. A table will be created showing different IP's at the server. One distinguished IP address will be assigned by server with the unique IP called Master IP (MIP) address and all the data from the server will be routed via this MIP address. Since the remaining IP address work as temporary address and these could be changed if the gateway changed.

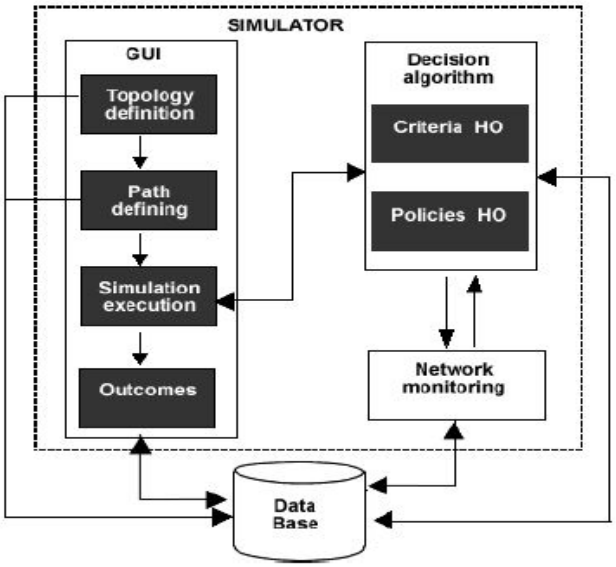

Fig 4 Proposed Architecture

MODULES

- The simulator will be integrated of three modules
- Graphic user interface,
- Decision algorithm and network monitoring data bases**.**

PROPOSED ALGORITHM

Vertical Handover Decisions from WiMAX to WLAN. Our proposed algorithm is aimed for vertical handovers from WiMAX to WLAN networks. It makes vertical handover decision from WiMAX to WLAN network considering the speed of the mobile node and the priority of the traffic class. It determines whether the incoming requests for vertical handovers from WiMAX to WLAN network will be rejected or accepted. If the speed of the mobile node while approaching the WLAN network from WiMAX network is above the acceptable threshold for the WLAN technology the incoming request for handover will be rejected and the mobile node will stay in the WiMAX network. If the speed of the mobile node is below the threshold and if the session's bandwidth is lower than the WLAN bandwidth, the other criterion of the algorithm must be fulfilled to start the process of the vertical handover to WLAN. The other criterion for mobile nodes is the session's priority. If the session's priority is low, the vertical handover procedure will start. If the session's priority is high, the mobile node will stay in the WiMAX network. The algorithm is implemented following these assumptions:

The algorithm is implemented following these assumptions:

- The geometry of the WLAN cell is circular;
- The mobile terminals are moving across the coverage of WiMAX and WLAN cells with a constant speed and in a straight line.

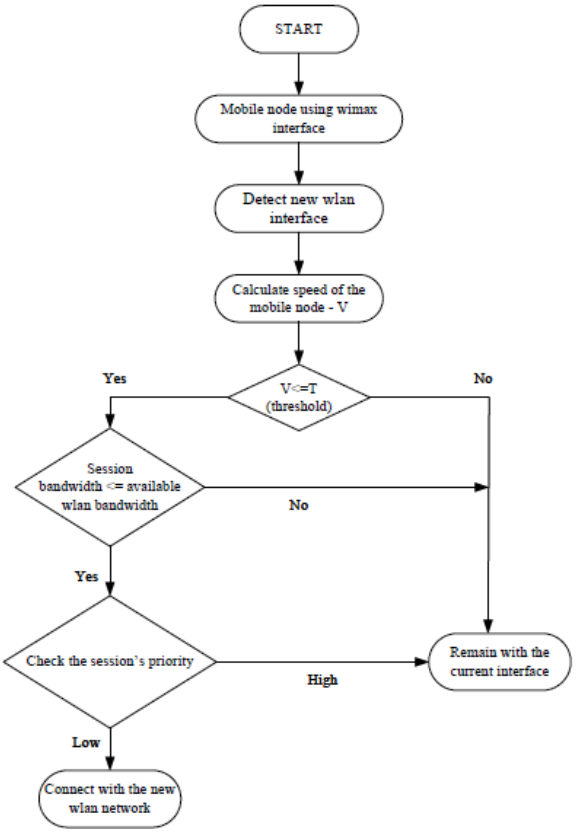

Figure 5. Proposed Vertical Handover Decision Algorithm

Applying the algorithm we achieve better channel utilization when using WiMAX/WLAN networks while still satisfying the QoS requirements of the users. It is applied only for the vertical handovers to the WLAN networks because the Access Points (AP) of the WLAN networks has lower coverage radius (from 50 to 100 meters depending on the type of 802.11 standards). When the radius of the AP is lower and the speed of the mobile node is higher it is better not to trigger a vertical handover to that AP. Furthermore, when there are mobile users with various types of traffic – real-time or non-real-time, it is better mobile users that use real-time traffic not to trigger vertical handover to the AP, because they are more sensitive to delays and handover latencies. Hence, we take this two important parameters, speed and priority of

the session when deciding whether to make vertical handover to particular WLAN AP. The scheme of our proposed algorithm is shown in Figure 5. Let *V* be the speed and let *T* be the threshold speed of the mobile node terminal in Figure 5.

The mobile users that move with speed above the acceptable velocity threshold will not be allowed to perform handover to WLAN from WiMAX. Among the users that move with a speed under the threshold, the algorithm checks if the traffic priority is low or high. We consider real-time traffic as high priority session like conversational or streaming. Non-real-time traffic, like web or background is regarded as low priority session in the algorithm. Hence, if the priority of the used traffic is low, than the algorithm will allow a vertical handover to the WLAN network.

HARDWARE REQUIREMENTS

Hard disk : 500 GB

RAM : 2 GB

Processor speed : i3

SOFTWARE REQUIREMENTS

Operating System : Win 7,Win 8

Platform : OMNET

Programming Language C,C++

Database Mysql

Performance Evaluation

In our simulations, for the purpose of testing the above proposed vertical handover decision algorithm, we use a two-tier heterogeneous wireless network structure that is composed of a WiMAX cell overlaying a WLAN hotspot.

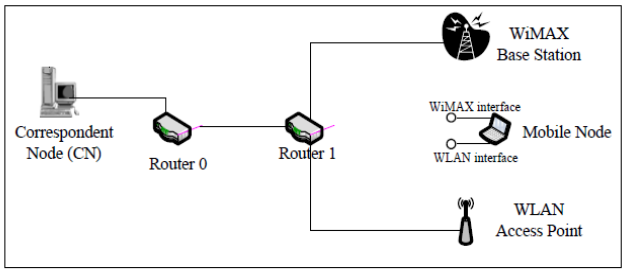

Fig 6 Heterogeneous Network Topology

Firstly, the simulations are done without applying our designed algorithm using provided IEEE 802.21 add-on module [9] for vertical handovers between WiMAX and WLAN. After analysis of the results we applied our vertical handover decision algorithm and made simulations using the same simulation scenario. Compared results of the QoS performances of average throughput, packet loss and vertical handover latency

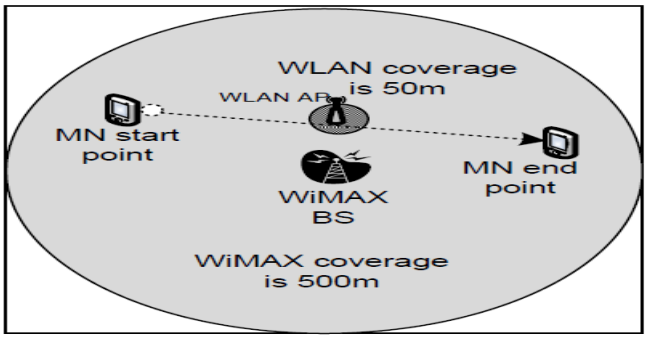

Fig 7 Heterogeneous Network Scenario with 30 Mobile Terminals

When we have simulated the specific scenario without applying our algorithm and using just the 802.21 simulator from NIST, 30 vertical handovers were triggered between WiMAX cell and WLAN hotspot. After the implementation of our algorithm in the specific scenario the number of vertical handovers was decreased to only 4. It occurred only for the mobile terminal nodes that were moving with speed equal or below the threshold speed and that were using low priority sessions.

CONCLUSION

WLAN and WiMAX require efficient handoff mechanisms to guarantee seamless connectivity. In this work two different types of interworking architectures were designed between WLAN and WiMAX networks namely: tightly coupled integration, loosely coupled integration, tight coupling with neighbor reservation and with gateway relocation. The parameters such as vertical handoff delay, In this paper our main contributions are: We will first create network in omnet .In this network there will be base station like 1) WLan 2) WiMAX Then every device transfer data and handover will be there In graphs you can see how data from one network to other is transfer and at which point authentication is done .The network simulation also shows that interworking architecture with gateway relocation outperforms the other coupling methodologies due to the reason that a secondary path is established prior to handover and it results in less handover delay, lesser packets dropped and high signal to noise ratio

FUTURE CHALLENGES

Future work, we will integrate our tool into existing network simulators. Currently, time-series packet traffic data is manually configured for simulation. We will also apply our tool suite to other useful case studies such as configuration, fault, and performance management

REFERENCES

1. Ms. Farah M. Khan, Prof. Satish K. Shah, Ms. Dharmishtha D. Vishwakarma , “A Review on Media Independent Handover Services for Heterogeneous Wireless Communication Networks”, International Journal of Electronics and Computer Science Engineering , IJECSE Volume 1, Number 3 , 2012.
2. Son Tran-Trong, Shahnaza Tursunova, and Young-Tak Kim , “Enhanced Vertical Handover in Mobile IPV6 with Media Independent Handover Services and Advance Duplicate Address Detection”, International Journal of computer applications, Volume 2,August 2010.
3. Abhishek Dhiman and Karamjit Singh Sandha, “Vertical and Horizontal Handover in Heterogeneous Wireless Networks using OPNET”, International Journal of Engineering Research & Technology (IJERT), Vol. 2 Issue 6, June 2013.
4. Safdar Rizvi, Asif Aziz, N.M. Saad, Nasrullah Armi, and Mohd Zuki Yusoff , ” Tight Coupling Internetworking Between UMTS and WLAN Challenges, Design Architectures and Simulation Analysis “,International Journal of Computer Networks (IJCN), Volume (3) Issue (2) 2011.
5. M. M. A. Khan, Omar Arafat, K. Dimyati and Fatima Seeme, “Seamless Mobility Management between IP-based Networks”, International Journal of Networks and Communications, 2012.

6. Jong-Tae Park, Seung-Mu Lee, and Seung-Man Chun ,"P2P-based Mobility Management Protocol for Global Seamless Handover in Heterogeneous Wireless Networks", International Journal of Electronics and Computer Science Engineering , IJECSE Volume 1,2011.
7. Wei wu, Alcatel, Nilanjan Banerjee, Kalyanbasu and Sajal k. Das, "SIP-based vertical handoff between WWANs and WLANs", IEEE Wireless Communications, June 2005.
8. Ahmad H. Talaat, Nael A. Hussein, Hussein A. Elsayed and Hadia Elhennawy, "Real-time Traffic Performance for WiFi Handovers over MIPv4 versus MIPv6", International Journal of Computer Applications (0975 – 8887), Volume 26– No.8, July 2011.
9. K. P. Demestichas, A. A. Koutsorodi, E. F. Adamopoulou, and M. E. Theologou, "Modelling user preferences and configuring services in b3g devices," *Wirel. Netw.*, vol. 14, no. 5, pp. 699–713, 2008.
10. H. Attaullah, F. Iqbal, and M. Javed, "Intelligent vertical handover decision model to improve qos," in *3rd International Conference on Digital Information Management.* IEEE Computer Society, 13-16 2008, pp. 119 –124.